

## CLAIMS:

What is claimed is:

1. A payload launch device comprising:  
an aerodynamic fairing having an internal cavity to contain a payload;  
a mounting adapter to attach the fairing to an exterior surface of a launch vehicle;  
and  
a release mechanism to separate the payload from the launch vehicle out of the fairing cavity during the launch vehicle's flight.
2. The device of Claim 1, wherein the mounting adapter is an integral part of the fairing.
3. The device of Claim 1, wherein the mounting adapter is an integral part of the payload.
4. The device of Claim 1 wherein the aerodynamic fairing is mounted to the mounting adapter which is mounted to the exterior surface of the launch vehicle.
5. The device of Claim 4, wherein the mounting adapter comprises a discrete plate with a plurality of attachment points.
6. The device of Claim 1, wherein the aerodynamic fairing comprises a monocoque graphite-epoxy structure.
7. The device of Claim 1, wherein the release mechanism deploys the payload by releasing the payload from within the fairing.
8. The device of Claim 1, wherein the release mechanism comprises one or more non-explosive actuators.
9. The device of Claim 1, further comprising a sequencer to initiate payload deployment by the release mechanism.
10. The device of Claim 1, further comprising an environmental sensor to initiate payload deployment by the release mechanism based on a parameter sensed by the environmental sensor.
11. The device of Claim 1, wherein the release mechanism deploys the payload in response to an external command;

12. The device of Claim 1, wherein the release mechanism comprises an ejection mechanism for ejecting the payload.
13. The device of Claim 12, wherein the ejection mechanism comprises guide rails and springs.
14. The device of Claim 1, wherein the release mechanism deploys the payload by releasing the payload from within the fairing in a direction opposite the direction of travel of the launch vehicle.
15. The device of Claim 1, further comprising a port coupled to the release mechanism and opened by the release mechanism prior during deployment of the payload to allow the payload to exit the cavity.
16. The device of Claim 1, further comprising an umbilical cable to connect the device to components within the launch vehicle interior.
17. The device of Claim 16, wherein the umbilical cable is adapted to provide power, commands and telemetry to the payload.
18. The device of Claim 16, wherein the umbilical cable is adapted to provide power, and commands to the release mechanism.
19. An external payload launch system comprising:
  - a launch vehicle having an interior and an exterior;
  - a motor to boost the launch vehicle into an exoatmospheric flight path;
  - a primary payload compartment in the launch vehicle interior to carry a primary payload;
  - a primary fairing to protect the payload compartment;
  - a secondary payload mounted to the exterior of the launch vehicle; and
  - a release mechanism to separate the secondary payload from the launch vehicle during the launch vehicle's flight.
20. The system of Claim 19, wherein the secondary payload is mounted to the exterior of the primary fairing.
21. The system of Claim 19, further comprising a power supply in the launch vehicle interior coupled to the secondary payload to support the secondary payload.

22. The system of Claim 19, further comprising command control and telemetry components in the launch vehicle interior coupled to the secondary payload to support the secondary payload.

23. The system of Claim 19, further comprising a secondary fairing mounted to the exterior of the launch vehicle to protect and contain the secondary payload in flight, and wherein the release mechanism releases the secondary payload from within the secondary fairing.

24. A method comprising:  
mounting a payload to an exterior surface of a launch vehicle, before the launch of the launch vehicle;  
setting a release mechanism to separate the payload from the launch vehicle exterior during flight; and  
separating the payload using the release mechanism after the launch of the launch vehicle.

25. The method of Claim 24, wherein separating comprises receiving a trigger signal from components inside the launch vehicle to start an ejection sequence.

26. The method of Claim 24, wherein the ejection sequence ejects the payload.

27. The method of Claim 24, wherein the payload is contained within an external fairing and wherein the ejection sequence ejects the fairing with the payload.

28. The method of Claim 24, wherein the payload is contained within an external fairing and wherein separating comprises opening a port through which the payload exits the fairing.

29. The method of Claim 24, wherein mounting a payload comprises mounting an aerodynamic fairing to the exterior surface of the launch vehicles and attaching the payload within a protected cavity of the aerodynamic fairing.

30. A payload launch device comprising:  
an aerodynamic fairing to protect a payload;  
a mounting interface to attach the device to an exterior surface of a launch vehicle.

31. The device of Claim 30, wherein the mounting interface is integrated with the fairing.

32. The device of Claim 30, wherein the mounting interface is integrated with the payload.

33. The device of Claim 30, wherein the aerodynamic fairing is mounted to a mounting adapter which is attached to the exterior surface of the launch vehicle through the mounting interface.

34. The device of Claim 30, further comprising a release mechanism to separate the payload from the launch vehicle during the launch vehicle's flight.

35. The device of Claim 34, wherein the fairing has an internal cavity to contain the payload and wherein the release mechanism separates the payload by releasing the payload from within the fairing.

36. The device of Claim 34, wherein the release mechanism further moves the fairing to expose the payload.

37. The device of Claim 34, wherein the release mechanism further separates the fairing from the launch vehicle with the payload.

38. The device of Claim 30, further comprising a release mechanism to move the fairing to expose the payload.

39. The device of Claim 38, wherein the release mechanism separates the payload from the launch vehicle.

40. A launch system comprising:  
a launch vehicle having an interior and an exterior;  
a motor to boost the launch vehicle into an exoatmospheric flight path;  
a primary payload compartment to carry a primary payload in the interior of the launch vehicle;  
a primary fairing to protect the payload compartment; and  
a secondary payload mounted to the exterior of the launch vehicle.

41. The system of Claim 40, further comprising a release mechanism to separate the secondary payload from the launch vehicle during the launch vehicle's flight.

42. The vehicle of Claim 40, further comprising a secondary fairing mounted to the exterior of the launch vehicle to protect the secondary payload in flight.